

Hot-Electron Photon Counters for Detecting Terahertz Photons

A document proposes the development of hot-electron photon counters (HEPCs) for detecting terahertz photons in spaceborne far-infrared astronomical instruments. These would be superconducting-transition-edge devices: they would contain superconducting bridges that would have such low heat capacities that single terahertz photons would cause transient increases in their electron temperatures through the superconducting-transition range, thereby yielding measurable increases in electrical resistance. Single devices or imaging arrays of the devices would be fabricated as submicron-sized bridges made from films of disordered Ti (which has a superconducting-transition temperature of ≈ 0.35 K) between Nb contacts on bulk silicon or sapphire substrates. In operation, these devices would be cooled to a temperature of ≈ 0.3 K. The proposed devices would cost less to fabricate and operate, relative to integrating bolometers of equal sensitivity, which must be operated at a temperature of ≈ 0.1 K.

This work was done by Boris Karasik of Caltech and Andrei Sergeyev of Wayne State University for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). NPO-40660

Magnetic Variations Associated With Solar Flares

A report summarizes an investigation of helioseismic waves and magnetic variations associated with solar flares, involving analysis of data acquired by the Michelson Doppler Imager (MDI) aboard the Solar and Heliocentric Observatory (SOHO) spacecraft, the Yohkoh spacecraft, and the Ramaty High Energy Solar Spectroscopic Imager (RHESSI) spacecraft. Reconstruction of x-ray flare images from RHESSI data and comparison of them with MDI magnetic maps were performed in an attempt to infer the changes in the geometry of the magnetic field. It was established that in most flares observed with MDI, downward propagating shocks were much weaker than was one observed in the July 9, 1996 flare, which caused a strong helioseismic response. It was concluded that most of the observed impulsive variations result from direct impact of high-energy particles. Computer codes were developed for further study of these phenomena.

This work was done by Vahe Petrosian of Stanford University for Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-14694-1

Artificial Intelligence for Controlling Robotic Aircraft

A document consisting mostly of lecture slides presents overviews of artificial-intelligence-based control methods now under development for application to robotic aircraft [called Unmanned Aerial Vehicles (UAVs) in the paper] and spacecraft and to the next generation of flight controllers for piloted aircraft. Following brief introductory remarks, the paper presents background information on intelligent control, including basic characteristics defining intelligent systems and intelligent control and the concept of levels of intelligent control. Next, the paper addresses several concepts in intelligent flight control. The document ends with some concluding remarks, including statements to the effect that (1) intelligent control architectures can guarantee stability of inner control loops and (2) for UAVs, intelligent control provides a robust way to accommodate an outer-loop control architecture for planning and/or related purposes.

This work was done by Kalmanje KrishnaKumar of Ames Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to the Technology Partnerships Division, Ames Research Center, (650) 604-2954. Refer to ARC-15340-1.